

[0001]

This application claims the benefit of priority from Japanese Patent Application No. 11-220000 filed on October 10, 1996, the disclosure of which is incorporated herein by reference.

[0002]

1. A high frequency oscillator and two or more amplifiers which amplify independently the high frequency electric power from a high frequency oscillator, respectively. High frequency plasma application equipment equipped with the single electrode with which it is arranged in the vacuum chamber in which plasma is formed, and two or more amplified high frequency electric power is supplied, and the means for arranging the phase of two or more high frequency electric power supplied to a single electrode.

## CLAIM + DETAILED DESCRIPTION

[Claim 1]

[Claim 1] A high frequency oscillator and two or more amplifiers which amplify independently the high frequency electric power from a high frequency oscillator, respectively. High frequency plasma application equipment equipped with the single electrode with which it is arranged in the vacuum chamber in which plasma is formed, and two or more amplified high frequency electric power is supplied, and the means for arranging the phase of two or more high frequency electric power supplied to a single electrode.

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to high frequency plasma application equipment adopting high frequency plasma, such as etching and CVD (chemical vapor DiPO<sub>2</sub>HNO<sub>3</sub>) equipment.

[0002]

[Description of the Prior Art] With high frequency plasma application equipment adopting high frequency plasma, such as etching and CVD equipment, high frequency electric power is supplied to the electrode arranged in a vacuum. Enlargement of the electrode with which high frequency electric power is supplied in these processes has been progressing recently. Drawing 1 shows the conventional example of such high frequency application equipment, and 1 is a high frequency oscillator. The high frequency electric power from the high frequency oscillator 1 is introduced to the electrode 5 in the electric discharge chamber 4, after 3 is amplified by the high frequency amplifier 2 and impedance matching is performed by the matching box 3. In addition, the inside 1 of a box 4 suppresses the influence of wiring from the output of a matching box 3 to an electrode 5.

[0053] With the above-mentioned composition, the high frequency electric power from the high frequency oscillator 1 is impressed to the electrode 5 in a chamber 4, after it is amplified with the high frequency amplifier 2 and impedance matching is performed by the matching unit 3. It is as a result, for example, on such apparatus, plasma will be formed between an electrode 5 and the etching material which is not distributed, and, as by picking material, etching processing will be performed by plasma.

[0054]

[Problem to be solved by the invention] As described above, area of the electrode 5 is enlarged these days, but with equipment, it has conveniently the structure where electric power is supplied to high frequency electric power at one place of an electrode 5 from one high frequency oscillator 1 to such a big electrode 5. Therefore, if not the fault to reach the voltage difference between the electric supply part of high frequency electric power and the end of an electrode 5 becomes large, and the intensity distribution of the plasma formed in chamber 4 made worsens as a result. As a result, if it is etching, etching unevenness will occur.

[0055] Moreover, in order to lessen the voltage difference between the electric supply part of an electrode 5, and an end, using a big high frequency power supply is also considered, but compared with the high frequency power supply of the output of several kilowatts order usually used in that case, a ratio becomes remarkably high and becomes difficult [the handling]. Since it will become a custom-made item instead of standard goods if a power supply becomes large in addition to it, a price will rise increasingly. Furthermore, although high-power high frequency electric power will be introduced into a vacuum through the wall of the electric discharge chamber 4, the technology of the line for large electric power, i.e., technology, such as electric strength and an electrostatic measure, cannot establish the introductory terminal T to the chamber 4 and a high power high frequency power supply cannot be used from this field, either.

[0056] This invention was made in view of such a point, and even if a big electrode is used for the purpose, it is to realize the high frequency plasma application equipment which can make intensity distribution of plasma uniform with easy composition.

[0057]

[Means for solving problem] Two or more amplifiers with which the high frequency plasma application equipment based on this invention amplifies independently the high frequency electric power from a high frequency oscillator and a high frequency oscillator, respectively, it is arranged in the vacuum chamber in which plasma is formed, and is characterized by having the single electrode with which two or more amplified high frequency electric power is supplied and a means for arranging the phase of two or more high frequency electric power supplied to a single electrode.

[0058]

[Function] While increasing high frequency electric power to two or more parts of the electrode for generating plasma, the phase of two or more high frequency electric power is arranged [0010]

[Working example] With reference to Drawings, the work examples of this invention is explained in detail hereafter. Drawing 2 shows one work example of high frequency plasma application equipment based on this invention, and gives the same number to the same or that of the conventional equipment of drawing 1, or a similar portion, and the explanation is omitted. The high frequency electric power from the high frequency oscillator 1 is supplied to the 2nd high frequency amplifier 10 through the 2nd high frequency amplifier 8 and phase SHIFUTA 1, 3, through the 1st high frequency amplifier 6 and phase SHIFUTA 7,

[0010] The output of the 1st high frequency amplifier 6 is supplied through the introductory terminal 12 near one end of one electrode 5 in the vacuum chamber 4 after impedance matching is carried out by a matching box 11. After impedance matching of the output of the 2nd high frequency amplifier 8 is carried out by a matching box 13, 4 is supplied to a part of the central part of the electrode 5 in the vacuum chamber 4 through the introductory terminal 14. The output of the 3rd high frequency amplifier 11 is supplied through the introductory terminal 15 near the end of another side of one electrode 5 in the vacuum chamber 4, after impedance matching is carried out by a matching box 16.

[0011] The high frequency output voltage of a matching box 11 is supplied to the phase detector 17 and the phase detector 18. The high frequency output voltage of the matching box 13 is also supplied to the phase detector 17, and the phase contrast of two sorts of high frequency voltage is detected. The high frequency output voltage of the matching box 16 is also supplied to the phase detector 18, and the phase contrast of two sorts of high frequency voltage is detected. The output according to the phase contrast of the phase detector 17 is awarded to phase SHIFUTA 7 through an amplifier 19. Moreover, the output according to the phase contrast of the phase detector 18 is supplied to phase SHIFUTA 9 through an amplifier 20. Operation of such operation is explained below.

[0012] The high frequency electric power from the high frequency oscillator 1 is amplified by the 1st high frequency amplifiers 6, 8, and 10, respectively